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Recent results of full kinetic simulations on cross-scale coupling process in space plasma

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Our interest in the space plasma dynamics is often biased towards large scale (MHD-scale) phenomena. In a dynamic situation, however, the well-known MHD approximation is not good enough, and such dynamical coupling process among the scales from electron to MHD is an essential point for understanding space plasma phenomena. High spec computational power of recent supercomputer system enables us to perform really macro-scale three-dimensional situations with full kinetic plasma simulation. With the help of the computational power, we have carried out large-scale full kinetic simulations on collisionless shocks, magnetic reconnection, etc. In this presentation, we will show recent results of these large-scale full kinetic simulations and discuss roles of cross-scale coupling processes in these elementary space plasma processes.

Keywords: space plasma, cross-scale coupling, particle simulation, magnetic reconnection, shock